cooking with style (and function)

By Eric Blinman

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IN NEARLY FIVE DECADES as an archaeologist I have analyzed or supervised the analysis of more than a million potsherds. The collections have originated from sites across a broad sweep of territory, from Wyoming to northern Mexico and from California to Texas, but most have come from the sites on the Colorado Plateau, otherwise known as the greater Four Corners region. The vast majority of these sherds have been from cooking jars, and they are often regarded as the poorer cousins of the painted pottery from the same collections.

What we tend to overlook is that the sheer abundance of cooking jars reflects their importance in the daily lives of those who made and used them. Cooking jars may not have been as valued socially or religiously as the painted pottery that dominates museum exhibitions, but cooking is the basis of family and community survival. Making cooking jars was an essential craft, and the women who made them and cooked with them were keenly aware of their value and qualities. Hidden within this intimate relationship is a complex record of technological innovation, often missed in the archaeologist's tendency to focus on superficial qualities of "style" or "type."

The earliest Southwestern pottery from southern Arizona and northern Mexico might be thought of as bric-a-brac. Saucers, small containers, and figurines from more than 3,000 years ago were part of a fired ceramic technology, but cooking still took place in roasting pits and boiling baskets. The adaptation of pottery to cooking happened around 2,000 years ago and within 500 years had spread across the physical and cultural landscape of the Southwest. Decreasing mobility and increasing reliance on agriculture are among the living conditions that encouraged the adoption of cooking pottery. Pottery is heavy and fragile, and living in one place from year to year allowed families to build up inventories of vessels that would be unimaginable if families were regularly moving from camp to camp across dozens of miles. Also, simmering in water is essential to the gruels and stews typical of agricultural cuisine for the sake of both nutrition and taste. Pottery frees the cook from the constant attention that moving hot rocks into and out of watertight baskets requires. The slow simmering of beans, even more than of corn, is thought to have led inevitably to the adaptation of pottery to Southwestern cooking.

The style, method of production, and intended use of cooking jars were intricately interwoven in their development. Clay swells and shrinks as it is wet and dries, and a vessel has to dry without cracking before it can be fired. Even "well-tempered" pottery clays can shrink 5 to 10 percent on drying, which constrains the shapes and angles of vessel design. Cooking jars can't have cracks (jars to be used for storing dry foods can crack and still be used), and the most robust shape to prevent shrinkage is a sphere. It makes sense that the earliest cooking jars were spheres with round mouths, a form called tecomates, or seed jars. These vessels are associated with pottery technologies of 1,500 to 2,000 years ago in the Southwest, especially those that relied on soil or arroyo clays that could be collected and used by potters without further modification.

Clay and temper

Clays are almost everywhere and can be extremely varied in their qualities. Some of the most plastic clays, those with an almost seductive potential for the potter, are too pure to be used without adding temper to control shrinkage. Almost any nonplastic material can be used as temper, although there are a wide variety of side effects that have to be considered. Plant fibers work as temper, but they burn out during firing, while mineral material (such as sand) results in a less porous ceramic. Rounded temper produces a structurally weak (crumbly) fabric, while angular temper produces a stronger finished vessel. Large-grained tempers produce a weaker fabric than those with finer particles. Temper with the same thermal-expansion properties as those of the surrounding clay produces a stronger fabric than temper that expands at a different rate during firing. Thus, a pot tempered with grog (crushed, fired potsherds) that has the same expansion properties as the clay is less likely to crack than one tempered with quartz, which expands and contracts as the vessel is heated and cools during the firing process. Quartz temper also creates

Opposite: Micaceous clay vessels such as the one on the right were made using the same techniques as those for non-mica cooking jars (left). Unlike today's micaceous clay pots, nearly all of the ancient mica pots were fired to a dark reflective gray color rather than being oxidized to bring out the brilliant bronze color of the clay. The most important difference between the "smeared indented" Rio Grande cooking jars like these and the corrugated cooking jars of Chaco and Mesa Verde is the way in which the vessels were constructed. A subtle upward-pointing clapboard texture on these vessels confirms that they were made by applying each fresh coil of clay to the inside of the growing pot as opposed to the corrugated style that requires the application of fresh coils to the outside of the pot. *Cundiyo Indented jar* (*left*) *and Sapawe Washboard jar* (*right*), *Northern Rio Grande, AD 1325–1425. Collection, Museum of Indian Arts & Culture.*

voids within the finished vessel wall, resulting in lower tensile strength than in vessels made with grog temper.

The sandstone mesas of the Colorado Plateau have abundant high-quality clays that required potters to practice shrinkage control. The earliest deliberately tempered ancient cooking jars were made with coarse, quartz-rich angular sands and crushed rocks. This recipe was stable for more than 1,000 years, despite a slow shift to other tempering materials, especially grog, in vessels made for purposes other than cooking. Because coarse quartz temper weakens the vessel wall through both size and crystal expansion during firing, it seems puzzling that Southwestern potters continued to use it for so long.

Archaeologist David Hill came up with an explanation that has to do with the difference between tensile strength and thermal shock resistance. The small voids that form around quartz temper particles during firing reduce overall strength, but they convey resistance to breakage from thermal stress. The temperature of the stew inside a pot won't exceed 100 degrees Celsius, while the coals of the cooking fire are far hotter—between 400 and 600 degrees. The resulting thermal stress across the vessel wall is so great that a homogenous pottery paste would crack catastrophically, like a porcelain plate placed on a gas stove flame. This explains why ancient cooking jars were engineered to be heterogeneous: when a crack began to form, its energy was absorbed when the crack reached one of the temper voids. Potters were making a conscious compromise in their cooking jars, accepting a lower tensile strength in exchange for longer use

The corrugation conundrum

Perhaps the most intriguing quality of ancient cooking jars, at least those made across the Colorado Plateau, is the widespread adoption of corrugation. Corrugation is actually part of a continuum of changing cooking jar textures. The earliest cooking jars were plain; then neckbands, unsmoothed coils of clay around the neck of a vessel, were added. The neckbands were elaborated, and finally, indented corrugations were created over the entire vessel surface. Coil sizes used to build the pots decreased from thumb- to pencil-size; stacked coils gave way to coils with substantial overlap, and smoothly formed clapboard coils gave way to rhythmic fingertip indentations. These changes occurred nearly simultaneously across the greater Four Corners area, providing archaeologists excellent tools for dating archaeological sites.

Speculation about the underlying function of corrugation has been interesting, if not amusing, especially since archaeologists have assumed that corrugation was difficult, or "expensive," to execute. Some suggest that corrugation allowed heat

Above: Cooking jar sizes were tailored to meal sizes. Sherds from the medium, family-sized pots are most frequently found in sherd collections, followed by sherds from small pots made for one or two-person meals. The largest cooking jars were used for large gatherings and are the rarest size that archaeologists find as sherds in trash, but the largest jars are over-represented in museum collections. When these large jars failed by cracking rather than shattering, they would be recycled into architectural storage. The cracked pot would be placed into the house floor, set deep enough that the mouth would be flush with the floor. Covered with a sandstone lid, the old pot would become a rodent-proof storage container. Secure and safe from further breakage, the large "whole" pot couldn't be dug up or moved easily, so it would be left behind for the archaeologist to find. *Mesa Verde Corrugated jars, before AD 1280. Collection, Museum of Indian Arts & Culture.*

Opposite: The corn-cob-scraped surface texture of early Navajo cooking jars probably helped the jars last longer in use, but the experiments to confirm this theory have yet to be conducted. *Dinétah Gray jar, Four Corners area into the Chaco region, AD 1500–1750. Collection, Museum of Indian Arts & Culture.*

to be transferred more efficiently from the hearth to the stew. Others point out that it improved the cook's grip on the vessel, making it less likely that she would drop and break it. The latter theory is consistent with the observation that before corrugation, cooking jar sherds account for 80 to 90 percent of sherds in trash deposits, but after corrugation, they drop to about 60 percent. Either other vessel forms were being broken at a much higher rate, or the corrugated cooking jars were lasting longer before they were broken and discarded.

Among archaeologists, as among all scientists, theories are made to be refuted. Our understanding of the function of corrugation was complicated by Lisa Young and Tammy Stone, whose experiments at the University of Arizona showed that textured surfaces actually resulted in slower heating of vessel contents, rather than the more efficient heating previously suggested, and the value of corrugation suddenly became even more of a mystery. Christopher Pierce, who took on the question in his dissertation, commissioned replica cooking pots from Clint Swink, an artist and replicator of Anasazi pottery. Swink produced a series of nearly identical pots with plain and corrugated surfaces. Pierce subjected the pots to laboratory heating experiments, complete with calibrated gas burners and computer-monitored temperature probes, using water and cornmeal gruel.

The results were dramatic. Pierce confirmed Young and Stone's observation of the inefficiency of corrugation for heating, but he added nuance. The greater surface area of the corrugated pots did appear to absorb heat effectively, but that was more than offset by the loss of heat in the upper portions of the vessel. The cooling effect of corrugated jar necks made it much less likely that the pot would boil over, clearly a benefit to the cook and her family. All of Pierce's plain jars failed, while only one of the corrugated jars cracked, confirming that corrugation results in a significant increase in the life of cooking jars. The corrugated texture of the vessel's outside surface allows it just enough flexibility in the face of heat expansion to lower the rate of catastrophic cracking.

Pierce and others' work has contributed to a functional model for understanding change in cooking jar design, at least on the Colorado Plateau. Tempers of coarse, angular minerals, dominated by quartz, create a pottery paste that resists failure during cooking, despite also resulting in lower tensile strength. The successful control of shrinkage allowed potters to diversify from tecomates to more versatile necked jars. Adding bands to vessel necks helped reduce the tendency of gruels and stews to boil over by pulling heat out of the bubbles, an advantage that increased as neck bands became narrower and more elaborate. The most dramatic innovation occurred when indented banding, which at first had been applied only to vessel necks, was extended over the entire vessel surface, doubling the life of cooking jars. The idea spread like wildfire from potter-cook to potter-cook.

However, this isn't the whole story. The relationship of style and function typical of the Colorado Plateau seemingly breaks down in the pottery of the Rio Grande Valley, a difference between the two regions that became apparent as archaeologists shifted their attention to the twelfth- to thirteenth-century climate-induced migrations of Pueblo peoples. Early twentieth-century archaeologists remarked on the "degenerate" appearance of cooking jars from Rio Grande sites compared to the jars they were finding on the Colorado Plateau. The derogatory names they gave the pottery types found along the Rio Grande—"smeared indented" and "blind corrugated"—fail to credit the value of these subtler textures in the pottery assemblages of the Rio Grande Valley. Such differences in regional technology seem to violate the neat functional principles that Pierce investigated.

Above: Although often clumsy in appearance, the early neckbanded jars represented a major improvement in cooking technology by reducing boil-over during cooking of beans, posole, or stews. *Kana'a Neckbanded jars, Arizona-New Mexico line, near Gallup, ca. AD 725–950. Collection, Museum of Indian Arts & Culture.*

What archaeologists have missed in the contrast between the cooking jars of the two regions is a difference in underlying construction technique. Colorado Plateau potters built their cooking jars by applying fresh coils of clay to the outside of the growing vessel, whereas potters in the Rio Grande Valley applied the fresh coils of clay to the inside of the vessel. These preferences for different construction techniques aren't obvious in sherd collections but are apparent in whole vessels, and the preference for the inside technique extends from earliest times to the present in the northern Rio Grande Valley. Hand motions in pottery-making are remarkably resistant to change—I have taught modern Tewa potters the outside indented corrugated technique, and they found it very awkward—so it isn't surprising that the Rio Grande potters stuck with their own approach to achieving a functional texture on cooking jars.

The mica mystique

The final chapter in cooking jar evolution is still being written. Sometime around AD 1400, potters began to use the rare and distinctive micaceous clays of the Sangre de Cristo Mountains. Mica cooking pots are known today as the best cooking jars in terms of taste, function, and beauty. The physical qualities of micaceous clay lie behind that reputation. Mica jars and the earlier cooking jars share common quartz temper, but mica platelets are even better at protecting a pot against weakening due to heat stress. Knowledge of mica's value spread as rapidly and widely as the news of corrugation had spread centuries earlier, inspiring trade and mimicry. Fifteenth- and sixteenth-century potters who didn't have access to real mica clays used small quantities of mica slip on the outside of their nonmica jars or the potters crushed mica-rich rocks to add to their nonmica cooking jar clays. We need a future round of experiments to determine whether these alternatives were as good as the originals, or poor knockoffs. ■

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